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The use of free-cost technology as a tool for assessment of production sites in a disease outbreak zone

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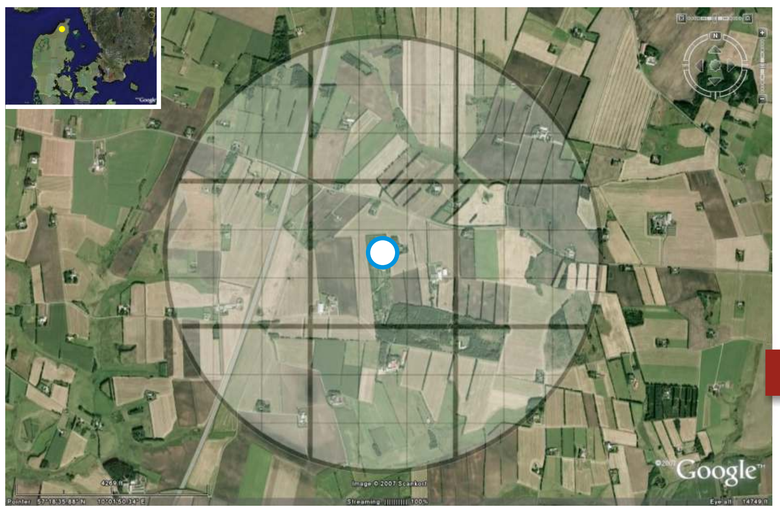
Introduction

Spatial assessment of a region is a crucial tool in cases of animal disease outbreaks and many countries are currently developing databases with geo-coordinates of their farms. However, mainly in developing countries, there is a significant lack of data on spatial distribution of animal production sites, including databases, software and the expertise needed to handle this type of data.

Currently, three-dimensional virtual globes are successfully using realistic Earth-surface skins from remote sensing data to create user-friendly graphic interfaces in popular freeware applications. The purpose of this study was to investigate whether this freeware technology can be used for a crude estimation of the number of animal production sites in a region, especially in buffer zones around a disease outbreak.

Materials and Methods

It was decided to test the potential of this free-cost technology in Denmark where all animal productions sites are registered in a central database and most have recorded geo-coordinates, which allowed for data validation. The software Google Earth was chosen as the freeware technology to provide visual area assessment of animal production sites. A total of 10 pig farms were randomly selected among all the pig farms currently active in the country. Buffer zones of 3 km were established around each selected farm and a grid was applied to these zones to facilitate the analysis (Pictures A and C). For each buffer zone, the total number of visually identified animal production sites was recorded (Pictures B and D).



A

B

C

D

- Randomly selected pig farm
- Visually identified animal production site, validated as a pig farm using data from the Danish Central Husbandry Registry (CHR)
- Visually identified animal production site, not confirmed as a pig farm

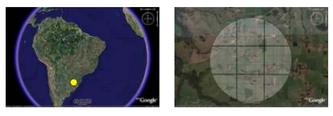
Results

Two of these grids are presented here: Pictures A and B include animal production sites from Hjelmsted, Northern Denmark, while figures C and D are from Grødby, island of Bornholm, Denmark. On both scenarios it was possible to visually identify potential animal production sites (pig farms) using the software. For a few farms, the data validation did not confirm the site as an active pig farm. Possible explanations include site currently without animals, other type of animal production and mis-identification.

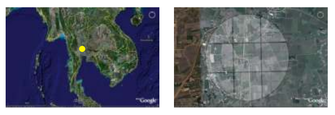
Discussion & Conclusion

The software established a primary assessment of farm distribution in a region with ease and as such proved to be a useful tool for first responders in animal disease outbreaks. It allowed rough estimations of the density and number of animal production sites in each zone. In addition, it was possible to validate the available geo-coordinates as well as identify animal production sites without recorded geo-coordinates. Limitations include the impossibility to identify farms without animals, production type and also the limited resolution for some areas. The use of this technology for direct visualization is not a substitute for proper area assessment, but a free tool to be used in cases where GIS data or expertise is not available.

Further application of the software for spatial first assessment on Outbreak Areas:



Scenario I
FMD Outbreak, Brazil, 2000



Scenario II
HPAI Outbreak, Thailand, 2005

Scenario III
ASF Outbreak, Kenya, 2007

I - Foot-and-Mouth disease outbreak in Jóia, Rio Grande do Sul, Brazil, in August 2000. A total of 22 infected farms and 11,087 animals sacrificed (cattle and pigs). Delays on the application of controlling measures were caused by absence of readily available spatial data on the affected region. II - Highly Pathogenic Avian Influenza outbreak in the province of Suphan Buri, Thailand, in July 2005. Outbreak detected by routine surveillance in 5 poultry farms. Identification of poultry farms within the outbreak zone was crucial due the control measures adopted (stamping out and zoning). III - African Swine Fever, Kiambu, Central, Kenya, in January 2007. With a case fatality of over 62%, this outbreak is continuing and may be seriously out of control. OIE stated that the source of spread is the illegal movement of animals in Kenya. Raster the animal production sites for surveillance becomes a priority for outbreak control.